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## PROBLEMS OF STATISTICAL INFERENCE AND OPTIMIZATION

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PROBLEMS OF STATISTICAL INFERENCE  
AND  
OPTIMIZATION WITH APPLICATIONS

J. S. Rustagi  
Department of Statistics

For the Period  
July 1, 1978 - September 30, 1981

DEPARTMENT OF THE NAVY  
Office of Naval Research  
Arlington, Virginia 22217

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FINAL REPORT

PROBLEMS OF STATISTICAL INFERENCE  
AND  
OPTIMIZATION WITH APPLICATIONS

J. S. Rustagi  
Department of Statistics  
The Ohio State University

Submitted to  
Office of Naval Research

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20. ABSTRACT (Continue on reverse side if necessary and identify by block number)  A brief account of the activities on the project is described. A list of all the publications on this project is also given.		

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## 1. Introduction

With the support of Office of Naval Research was initiated in the areas of regression models for grouped data and optimization techniques in statistics. The results obtained were communicated through interim technical reports and publications in journals. The list of such publications is given. ←

## 2. Publications on the Project

1. Indrayan, A. and Rustagi, J. S. (1979). Approximation Maximum Likelihood Estimates in Regression Models for Grouped Data, Optimizing Methods in Statistics, (Editor, J. S. Rustagi), Academic Press, New York, pp. 301-309.
2. Rustagi, J. S. (1979). Recent Applications of Variational Techniques in Statistics, Technical Report No. 186, Department of Statistics, The Ohio State University, pp. 1-14.
3. Rustagi, J. S. and Yang, Joanne (1979). Estimation of Rate Constants in Michaelis-Menten Model, Technical Report No. 177, Department of Statistics, The Ohio State University.
4. Indrayan, A. and Rustagi, J. S. (1981). Approximate Tests of Hypotheses in Regression Models for Grouped Data, Commun. Statist. - Simula. Computa., B10 (4), pp. 327-341.
5. Rustagi, J. S. (1980). Statistical Considerations in Control Models with Applications, Technical Report No. 211, Department of Statistics, The Ohio State University, pp. 1-35.
6. Some Tests of Randomness with Application, Technical Report No. 222, Department of Statistics, The Ohio State University, pp. 1-35, (1981).
7. Rustagi, J. S. (1981). Probabilistic Structures of Modern Lottery Games, Technical Report No. 236, Department of Statistics, The Ohio State University, pp. 1-35.
8. Rustagi, J. S. (1982). Optimizing Techniques in Simulation, Digital Simulation Tools Handbook, (Editor, A. N. Silver), McGraw-Hill Book Company, New York, (To appear). Technical Report No. 239, Department of Statistics, The Ohio State University.
9. Rustagi, J. S. and Zanakos S. (Editors) (1982). Optimization in Statistics, TMS Advanced Studies in Management Sciences, (To appear).
10. Rustagi, J. S., Tech, N. and Yousry, M. (1981). Bibliography of Recent Literature on Optimizing Methods in Statistics, Technical Report No. 240, Department of Statistics, The Ohio State University.

11. Rustagi, J. S. (1981). Introduction to Optimization in Statistics, Technical Report No. 249, Department of Statistics, The Ohio State University.
12. Berliner, L. Mark (1981). Uniform Improvements on the Certainty Equivalent Rule in a Statistical Control Problem, Technical Report No. 237, Department of Statistics, The Ohio State University, pp. 1-12.

### 3. Impact of the Work on Science and Navy

We describe here briefly the impact various aspects of the research have made on the scientific community and the Navy.

(i) In recognition of the importance of Optimization in Statistics, The Institute of Management Sciences and Operations Research Society are publishing a volume of invited and contributed papers on Optimization in Statistics with special applications in management sciences. The volume is prepared under the editorship of J. S. Rustagi and Stelios Zanakis of Florida International University.

(ii) J. S. Rustagi was invited by the editor of Digital Simulation Tools Handbook, to be published by McGraw-Hill Book Company to write a chapter on Optimizing Techniques in Simulation under the editorship of Dr. A. Silver.

(iii) Dr. Robert E. Machol of Office of Naval Research, London office brought to our attention a problem of a Czechoslovakian economist, Jan Klacek, who was interested in some aspects of an optimization problem. A satisfactory resolution of the problem was made.

(iv) Contact was made by a naval scientist, Dr. Derrill J. Bordelon from U.S. Naval Underwater Systems Center, Newport, Rhode Island, regarding Fisher Information when parameter is random.



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From the above contacts, it seems that the work has found some applications in the Navy and the scientific community.

4. Other Related Publications and Activities

- (i) J. S. Rustagi spent the Summer, 80 at Stanford University, Department of Statistics as a visiting scholar.
- (ii) In October, 80, a Conference on Teaching of Statistics and Statistical Consulting was organized at The Ohio State University jointly by J. S. Rustagi and D. A. Wolfe. The proceedings are published by Academic Press under their editorship to appear in April, 1982.
- (iii) Scientific meetings attended were:
  - IMS annual meetings at Vail, Colorado, 1981,
  - IMS meeting at Davis, California, 1980 and
  - ASA annual meeting at Washington, 1979.
- (iv) J. S. Rustagi was invited speaker at the Canadian Conference on Applied Statistics, Montreal, April, 1981 and lectured at the Indian Statistical Institute and Institute of Agricultural Statistics in July, 1979.
- (v) J. S. Rustagi was director of the IMS-ONR Advanced Lecture Series on Variance Components, g-Inverses and Applications given by Prof. C. R. Rao, July, 1979.
- (vi) J. S. Rustagi participated in U.S.-India Exchange of Scientist Program with visits to Indian Statistical Institute, Indian Institute of Agricultural Research Statistics and Indian Institute of Technology, Bombay, March, 1980.

(vi) J. S. Rustagi assumed the Managing Editorship of Annals of Statistics and Annals of Probability on January 1, 1981 and is a member of the Council of Institute of Mathematical Statistics.

5. Research Personnel on the Project

- (i) Mr. Nick Teoh, July, August, 80
- (ii) Ms. Mona Yousry, July, August, 80
- (iii) Ms. Svetlana Dynin, January 1-July 31, 81
- (iv) Prof. L. M. Berliner, August, 81.